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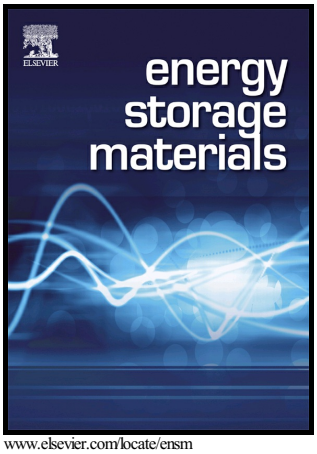

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Encapsulating sulfur in δ-MnO_2 at room temperature for Li-S battery cathode

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Abstract

Sulfur is a promising alternative lithium battery cathode for its low cost, abundance, and high specific capacity. However, issues of rapid capacity decay and low coulombic efficiency hamper its practical application pace owing to polysulfides dissolution. Despite efforts on hybridizing sulfur with metal oxides to solve these issues are considered to be effective, the synthesis of hybrid materials is always tedious. Herein, S@MnO_2 hybrid material was synthesized via a green method at room temperature. We encapsulate S spheres in poly-dopamine (PDA) by in-situ polymerization of dopamine. The formed PDA shell is served as reducing agent and sacrificial template to transform $KMnO_4$ into δ-MnO_2 shell without adding any other agents (such as acid). δ-MnO_2 encapsulates the S spheres uniformly and succeeded in entrapping polysulfides when S@MnO_2 used for Li–S battery, endowing the S@MnO_2 cathode with high reversible capacity, improved cycling stability, and satisfied coulombic efficiency. Moreover, this method could be adopted for hybridizing δ-MnO_2 with diverse materials (such as CNTs@MnO_2) in mild reaction environment (ambient pressure and temperature), exhibiting an extensive application